ther it was for the Husband or Wife, for it may be read *Antoniæ*. The Points alſo betwixt the words are here very ſingular, but this was the caprice of the *Stone-cutter*, who ſometimes alſo uſe a Leaf, hanging or erect, a Hand, a Feather, or ſuch odd fancy for Points.

An Abstract of a Letter from Mr. Anthony Leewenhoeck *writ to* Sir *C. W.*

Jan. 22. 168$\frac{2}{3}$. *from* Delft.

Having lately met with a Book publiſhed by a Phyſitian of our *Country*, which treats of Humane *Generation*, and the *Egg-branch* as it is found in Women-kind; and not doubting but what is there ſaid, is alſo applicable to Four-footed Beaſts, I examin'd (in the preſence of a *Phyſitian* and other learned Perſons as well as alone) the *Egg-branches* of ſeveral *Lambs* of a year old, that had been ſeveral Months in the Winter kept in a Stall for fatting, ſeperated from the *Ramms*. From what I have hitherto found I cannot but wonder why it ſhould be generally believed, That the *Tuba Fallopiana* does draw, or ſuck down an *Egg* from the *Egg-branch*, thro ſo narrow a paſſage, as I ſhew'd the *Tuba Fallopiana* to have. Conſidering therewithal that ſome of the *Eggs* were as big as Peaſe, and others as large as the whole *Egg-branch*: That they were made up of Glandulous parts interwoven with Blood-Veſſels, and were ſhut up ſo faſt in their Skins or Membranes that I could not with my Nails tear one of them from the *Egg-branch*: That ſome of them conſiſted of very irregular and unlike parts, which were in ſome places incloſed in particular Skins, and had not at all the ſhape of an *Egg*: That ſome of them which ſtood out beyond the reſt were burſt open; and yet when I went to pull them off, they ſtuck ſo faſt, that the whole *Egg-branch* came along with them. The ſmalleſt *Eggs*, and of a leſſer ſize, were alſo firmly rooted and fixt in their skins, and had often a Wateriſh ſubſtance in them. That beſides the ſuppoſed *Eggs* of the *Egg-branch*, there were others lying at a diſtance from it of an Inch and more, on each ſide of the *Womb*, and were included in particular Skins.

My Opinion therefore of theſe *Eggs* is, that they are *Emunctorys*, or the *Emptyings* of ſome *Veſſels* lying near, ſuch as are often found among the Membranes, or adhering to the Bowels of *Animals*. But as to *Generation* tho I have formerly been very reſerv'd in declaring my thoughts thereof, yet being now further inſtructed by manifold *Experience*, I dare venture to affirm it rather to come from an *Animalcule*, (ſuch as I find not only in *Human Seed*, but *that* of all Birds, Beaſts, Fiſhes, and Inſects) than an *Egg*. And the rather for that I find in the *Seed* of a *Man*, as alſo of a *Dog*, two different ſorts of *Animalcules*, anſwering the different *Sexes* of Male and Female.

I know ſome men will even ſwear that they have found the aforeſaid *Eggs* in the *Tuba Fallopiana* of Beaſts. But I need not believe that theſe round Bodies they have ſeen in it, ſhould be drawn down from the imagined *Egg-branch*, thro the long and very narrow paſſage of the *Tuba Fallopiana*; Becauſe ſome of the Bodies are as big as a *Peaſe* (nay as the whole *Egg-branch*); and of a very firme and compacted Subſtance: But the way thro which they ſhould paſs is no wider than the Compaſs of a ſmall *Pin*. Again if it were ſo as is ſaid, theſe bodies would be found, not by Chance, but always when ſearched for immediately after *Copulation*; but that is ſo far from being true, that it is hardly to be imagined, if we conſider how little time is taken up in the *Copulation* of ſeveral *Animals*, as a Cow, Rabbet &c. In which ſo ſhort time nevertheleſs ought to be drawn down, thro a long and narrow Paſſage, a great number of Bodies; in ſome Caſes two or three, in others

Six or Eight, and more, according to the number of *Fœtus*'s to be produced.

But ſuppoſing ſuch Bodies there to be found, why may they not be formed *ex reſiduo Seminis Maſculi*, gathered together into a *Ball* or *Globule*; as we ſee ſeveral other Subſtances in Animals that are neither of too thick nor too thin a Conſiſtence, as Fat, *Sanies* &c. which how they are made, I have formerly given an account. Or Secondly there being no part of the Body which is not nouriſhed, and which does not caſt off ſomethings that are ſuperfluous, why may there not in the *Womb* or *Tuba* be ſeveral Excretions made which by Compreſſion on all ſides may be brought into a round figure? This ſuppoſal being true, it will follow that *Egg-like* Bodies are alſo in the *Womb* or *Tuba* of Females that have not accompanied with the Male.

It may be queried, If one *Animalcule* of Seed be ſufficient to produce a *Fœtus*, why are there ſo many Thouſands in one drop of it?

I anſwer that in an *Apple-Tree* (enduring an Hundred years and bearing every year a great many Thouſand Bloſſoms, which may a great part of them be *Apples*, having each of them Six or Eight Seeds) each Seed being placed in a proper Soil, and carefully cultivated, is capable of becoming a Tree; yet it may happen that nothing grows from all the Apples that fall down; whether thro want of Sun, Rankneſs of Graſs, Weeds, or other Accidents. So in the Womb each Animalcule might ſuffice for a *Generation*, if the place where it comes to be nurſed be fit for it; But the VVomb being ſo large in Compariſon of ſo ſmall a Creature, and there being ſo few *Veſſels* and places fit to feed it, and bring it up to a *Fœtus*; there cannot be too great a number of Adventurers, when there is ſo great a likelyhood to miſcarry.

It may be asked again, why a VVoman bringeth forth but one or two Children, ſince if there were but two proper pla-

places in a *Uterus*, ſeveral of the *Animalcules* might there be fed.

I anſwer, it may happen to theſe *Animalcules*, as it does to Seven or Eight *Seeds* put into a ſmall hole of the ground; that *Seed* which puts out the biggeſt and ſtrongeſt Root, ſtarves all the reſt, and becomes a Tree.

It may be asked me again, why I make the *Animalcules* found in the Seed of ſeveral Animals to be of ſuch different Sizes, comparatively to the Animals they belong to *viz.* in the ſpace of a ſmall Sand in the Seed of a *Cock* 50000. in the Row of a *Cod-fiſh* 10000. in the Row of a *Ruff* (which fiſh is a 1000 times leſs than a Cod-fiſh) the *Animalcules* as big as the others. Whereas it ſeems reaſonable that the *Animalcules* ought to be in bigneſs to one another, as the *Creatures* inwhich they are found; from whence it would follow, that thoſe *Animalcules* which are in *inſects*, would never be capable of being diſcovered, becauſe of their exceeding ſmallneſs.

I anſwer that we muſt ſatisfy our ſelves in theſe things as well as we can, for (not to ſpeak of a *Coco Nut*) a great *Wall-nut* with his green ſhell weighs down a 1000 *Apple Tree Seeds*, and yet the proportion between the Trees is not ſo great.

In my Letter of the Third of *March* 168$\frac{1}{2}$ I deſcribed the texture of a *Fleſh* and *Fiſh-muſcle*; But have ſince examined that of a *Flea*, as judging that if I could find the ſame *Filament*, I might be poſitive that the Muſcles of *Animals* are all of the ſame make; haveing therefore ſeveral times ſeperated and expoſed to View that *Muſcle* of the Breaſt, whereto the Leg is partly faſtned; I obſerved the ſame *Ring:like Indentings* in the *Filaments*, that I had ſeen in other places. Some appeared to me thicker in the middle then at the ends as *Tub*. 2. *Fig*. 1. *A B C D E F G H* is the Deſcription of the *Filament* of a *Flea* broken out of the Breaſt, from which I perceived the *Filaments* of this Inſect to grow Tapering towards the ends, and loſe themſelves in a *Membrane* or *Tendon*, like the *Filaments* of the *Muſcle* of an *Ox*. Some of the *Indentings* were as *C F*, but moſt throughout were as A B G H. Several times I had an appearance as if a *Filament* were conſtituted of ſeveral leſſer threads joyned together, and lying by the ſides of one another.

In purſuing my *Obſervations*, I took ſome of the Fleſh of the Legs of the *Flea*, and found it like that of the Breaſt; here I counted 12. of theſe before named *Filaments*, and ſome threads without *indentings* which I conceived might be *Veſſels*.

I alſo with much trouble took out the *Teſticles* of a *Flea*, and placed them before my *Microſcope*, and drew out the *Figure* as well as I could, as Fig. 2. A B C D is the *Teſticle*, A F and D E are the *Vaſa Deferentia*, when the *Teſticles* were firſt taken out they were of a dark Colour, but in leſs then $\frac{1}{10}$ of a minute their *moiſture* was evaporated, and then they became crumpled, which I have here repreſented as well as I could.

I alſo ſearched for the *Veſſels* having as it were *Rings* about them (of which I have formerly ſpoke) and am ſatisfied they cannot be *Air Veſſels*, but rather *Arteries*; for I ſaw them not only encompaſs the *Guts* but ſpread over and among the *Eggs*.

The *Sting* or *Snout* of the *Flea*, or rather the *Sheath* of it in which it is kept, had Teeth on each ſide like a *Saw*; and may not unfitly be compared to a *Quill* that is ſplit ragged. When the Sting is encloſed in the *Sheath* the *Teeth* on each ſide go between one another. The length of this *Sheath* is about Three *Diameters* of the thickneſs of a *Hair*,

I have made many *Attempts* the laſt *Autumn*, to find out in what time the *Worm* coming from the *Eg* of a *Flea*, would become a full grown *Flea*. The *Egs* of a *Flea* kept in a warm place were hatched in four days, and became *Worms*, which I endeavored to bring up, but notwithſtanding

ding all my endeavours I could keep them no longer alive than Twelve dayes. When I placed about the half of a ſmall *Flye* in the glaſs by the *Worms* for their Food; the part of the *Flie* cauſed ſuch a *Steam* on the glaſs that the *Worms* being hairy were intangled in the moiſture, and remained immoveable till they died. When the *Worms* were Twelve daies old, they were about the length of Four *Eggs* and the thickneſs of One. Since I could bring up no *Worms*, I took ſome which I thought had attained their full growth, and obſerved the ſame to ſpend Eight or Ten daies in *Spinning* their *Web*, and then they ſtript of their *Skin* and became a *Nympha*. Theſe *Nympha's* I ſaw move on the Fourth day, tho they were Clear and White: on the Sixth they were Red about the Head: on the Tenth they broke their *Caſe*, which was a very thin Skin, and leapt into the Glaſs, liveing there without Food for the ſpace of Seven dayes

I alſo took ſome fleſh from the Breaſt of a *Louſe*, and found the *fleſh Threds* of the ſame make as thoſe of the *Flea*.

I took alſo the fleſh from the feet of a *Gnat*, and found that of the ſame make with the former. But perceiving the Legs and Body of the *Gnat* to be furniſhed with very fine *Feathers*, I have cauſed them to be drawn as Fig. 3. The *Wing* alſo of the *Gnat* being adorned with *Feathers*, I have drawn that too as Fig. 4. which is a *Wing* as it appears to the naked Eye. Fig. 5. A B C is the ſame repreſented in a larger proportion, to ſhow that not only the whole Circumference of the *Wing*, as here 5. A B C is beſet with great and ſmall *Feathers* as Fig. 6. But alſo the *Nerves* that ſtiffen the Wing, as DDDD. The *Film* of the Wing which is between the *Nerves* DD, ſeemeth by the *Microſcope* to be full of a great many ſmall Riſings; but upon a ſtricter Examination, they are really ſmall *haires*, as Fig. 7, where a begining was made to repreſent the whole *Wing*: A B C are the *Feathers*, and ADEC are the *haires* on the *Film*.

A certain Phiſitian having told me that ſeveral people aflicted with *Agues*, had been cured thereof by the uſe of *Sal volatile Oleoſum*, which had attenuated and rarified their blood. I reſolved to make what obſervatious I could, of the mixture of that *Salt* with *Blood*. And therefore pricking my finger with a *needle*, I put the firſt time two parts of *Blood* to one of *Salt*; a ſecond time equal parts of each, The *blood* turned immediately of a more lively red color, as blood uſually does when mixed with *fair Water* (for I am of the Opinion that when blood running from a Vein is of a dark-red or blackiſh colour, the reaſon of the blackneſs is, that the *Globules* which make the blood red are not ſufficiently diluted with that liquor which *Phiſitians* call the *Whey* of the blood).

Upon viewing my *Blood* one day, I found it ſomewhat *blacker* then ordinary, but not reflecting thereon, and the next day working till I ſweat, I was ſeized with an *Ague*; which I then thought might be cauſed by the thickneſs of my *Blood*; and therefore bethought my ſelf of ſuch things as would attenuate it, drinking a great deal of *Warm Tee*, a[illegible]ety well therewith, I continued it, u[illegible]t I took a little ſmall bear, eating little but a Sallet of *Endive*. Upon the Fourth day my *Urine* came again to its Natural Color.

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But to come more particularly to the *alterations* made in the *blood* by *Sal Volatile Oleoſum*, The parts of that blood that lay neareſt the *Salt*, changed colour firſt, and by degrees thoſe further diſtant. But taking my *Microſcope* to obſerve it, I found the *Blood Globules* each to be diſſolv'd into Six diſtinct *Globules*.

I then took Four parts of *Salt* &c. and one of *Blood*, and viewing it as quick as I could with my glaſs I found ſome of the *Blood Globules* much diminiſhed in ⅛ of a minute, but in ¼ of a minute they were wholly diſſolved. I ſaw once 20 *Blood Globules* at a diſtance from the reſt, but in continuing to tell them they came firſt to 18. then 16. after to 3. or 2. which alſo were diſſolving.

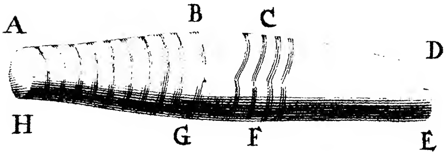
There was alſo here and there a *Globule* that would not diſſolve; nor with a very little *Salt* would any.

What may be the *Cauſe* of theſe *Effects*, I cannot ſay, but as to the *Effects* themſelves, I imagine that the *Sal Oleoſum* being taken inwardly, and conveyed into the *Lacteæ*, and *Veins*, may have the force to hinder the Compounding the *blood Globules*, by which means the *blood* may become more *thin*, and perform its *circulation* more eaſily. An effect not altogether unlike this, we have from the *Brimſtone-Match*, with which the *Wine-Coopers* ſmoak their *Cask's*, thereby to hinder the *wine* from thickning and working. But *Brimſtone* hath not the force of making *Wine* that is already thick, grow thin.

I lately read a *Phyſitian* of our *Country*, who affirms there is a *fermentation* and riſing in the *Blood*, cauſed by the Intercourſe it has with the *Air* in the *Lungs*, as we ſee a Riſing in *Dough* cauſed by *Yeſt*.

That there is a great deal of *Air* ſwallowed down into the *Stomack* with our *meat*, (and ſome made out of the *meat* it ſelf) which afterwards enters the *Blood*, I do not deny, nor that there may be *Air* contained in the *blood*, in the ſame manner as there is in *warm Water*, or *Wine* that does not work. But I can't conceive there ſhould be ſuch large *bubbles* in the *blood*, as are cauſed in *Dough* by *Yeſt*, for theſe *Bubbles* moving in a liquid body, whenever their Superficies came to touch, would unite together; whence it would follow, that a great part of the *Blood-Veſſels*, would be full of nothing but *Air*. Again if there were *Air bubbles* in the *blood*, tho' a 1000 times leſs than a *Sand*, I ſhould have diſcovered them, in my many *Obſervations* made about the *blood* for 11. or 12. years laſt paſt.

Fig. 1.



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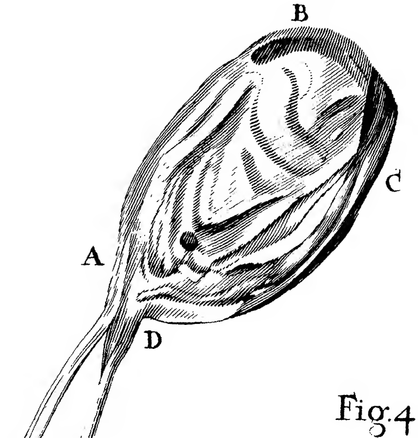


Fig. 3.

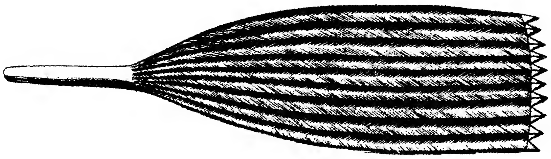
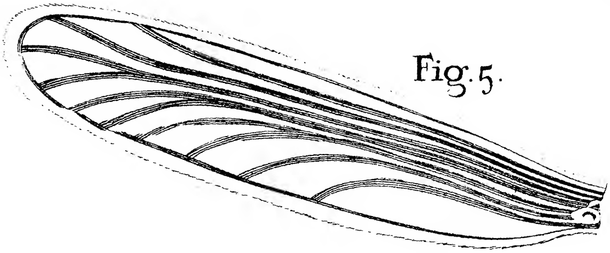


Fig. 4.

Fig. 5.



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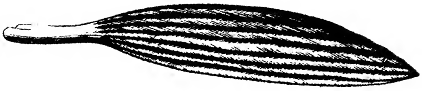
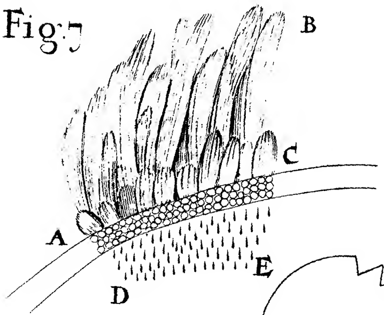


Fig. 7



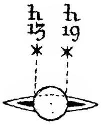


Fig. 8.

Fig. 9.

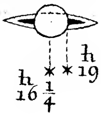


Fig. 10

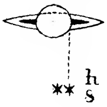


Fig. 14.

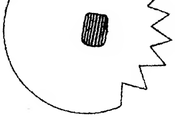
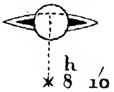


Fig. 11.



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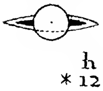

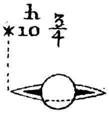

Fig. 13.